CLAIMS

What is claimed is:

1. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) providing a substrate comprising a surface layer of a group III-nitride, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a layer of $Al_uGa_{1-u}N$, wherein u ranges from 0 to 0.30, over the substrate;

ii) maintaining the substrate at about the temperature of step i), and forming a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the $Al_uGa_{1-u}N$;

iii) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

iv) maintaining the substrate at about the temperature of step i), and forming a well layer of $In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

v) maintaining the substrate around/at the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

vi) forming a second cap layer of GaN or AlGaN over the first cap layer;

thereby obtaining a device that emits light in blue or green wavelengths.

2. The method of claim 1, wherein the group III-nitride is GaN.

3. The method of claim 1, wherein the forming steps are performed by metalorganic chemical vapor deposition using trimethyl indium, triethyl indium, ethyldimethyl indium or a mixture of at least two thereof as an indium precursor.

4. The method of any one of claims 1, 2 or 3, wherein trimethyl gallium, triethyl gallium, ethyldimethyl gallium or a mixture of at least two thereof is used as a gallium precursor.

5. The method of claim 4, wherein ammonia or dimethylhydrazine is used as a nitrogen precursor and hydrogen, nitrogen or a mixture thereof is used as a carrier gas.

6. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) providing a substrate comprising a surface layer of a group III-nitride, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a first layer of GaN or $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the substrate;

ii) maintaining the substrate at about the same temperature as the temperature of step i), and forming a second layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the first layer;

iii) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the second layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

iv) maintaining the substrate at about the temperature of step i), and forming a well layer of

$In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

v) maintaining the substrate at about the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

vi) forming a second cap layer of GaN or AlGaN over the first cap layer;

thereby obtaining a device that emits light in blue or green wavelengths.

7. The method of claim 6, wherein the group III-nitride is GaN.

8. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) providing a substrate comprising a surface layer of a group III-nitride, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a first layer of GaN or $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the substrate;

ii) maintaining the substrate at about the same temperature as in step i), and forming a second layer of $Al_uGa_{1-u}N$, wherein u ranges from 0 to 0.30, over the first layer;

iii) maintaining the substrate at about the temperature of step i), and forming a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the $Al_uGa_{1-u}N$;

iv) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

v) maintaining the substrate at about the temperature of step i), and forming a well layer of
$In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

vi) maintaining the substrate around/at the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

vii) forming a second cap layer of GaN or AlGaN over the first cap layer;
thereby obtaining a device that emits light in blue or green wavelengths.

9. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) forming upon a substrate having a surface layer, at a temperature of from 700°C to 850°C, a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, or a layer of $Al_uGa_{1-u}N$, wherein u ranges from 0 to 0.30, over the first layer;

ii) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the second layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

iii) maintaining the substrate at about the temperature of step i), and forming a well layer of
$In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

iv) maintaining the substrate at about the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

v) forming a second cap layer of GaN or AlGaN over the first cap layer;

thereby obtaining a device that emits light in blue or green wavelengths.

10. The method of claim 9, wherein the surface layer of the substrate is a layer of GaN or

$In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, that is grown at the same temperature as the temperature used in step i).